

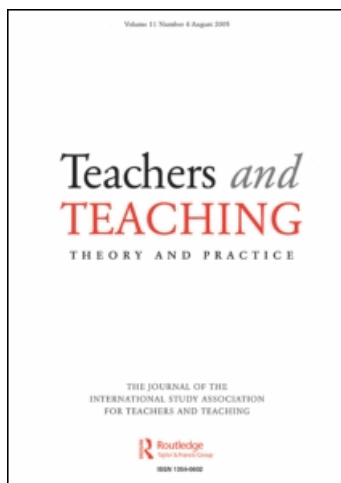
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Experienced teacher learning within the context of reciprocal peer coaching

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A considerable amount of literature on peer coaching suggests that the professional development of teachers can be improved through experimentation, observation, reflection, the exchange of professional ideas, and shared problem-solving. Reciprocal peer coaching provides teachers with an opportunity to engage in such activities in an integrated form. Even though empirical evidence shows effects of peer coaching and teacher satisfaction about coaching, the actual individual professional development processes have not been studied extensively. This article offers a way to analyse and categorize the learning processes of teachers who take part in a reciprocal peer coaching trajectory by using the Interconnected Model of Teacher Professional Growth as an analytical tool. Learning is understood as a change in the teacher's cognition and/or behaviour. The assumption underlying the Interconnected Model of Teacher Professional Growth is that change occurs in four distinct domains that encompass the teacher's professional world: the personal domain, the domain of practice, the domain of consequence and the external domain. Change in one domain does not always lead to change in another, but when changes over domains do occur, different change patterns can be described. Repeated multiple data collection methods were used to obtain a rich description of patterns of change of four experienced secondary school teachers. The data sources were: audiotapes of coaching conferences, audiotapes of semi-structured learning interviews by telephone, and digital diaries with teacher reports of learning experiences. Qualitative analysis of the three data sources resulted in two different types of patterns: including the external domain and not including the external domain. Patterns of change within a context of reciprocal peer coaching do not necessarily have to include reciprocal peer coaching activities. When, however, patterns do include the external reciprocal peer coaching domain, this is often part of a change process in which reactive activities in the domains of practice and consequence are involved as well. These patterns often demonstrate more complex processes of change.

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Introduction

A major question in teacher change literature revolves around the issue on changes in knowledge, beliefs and attitudes preceding or following changes in teacher practice (Wubbels, 1992; Richardson & Placier, 2001; Bolhuis, 2006). Today, it is widely assumed that when teachers change their knowledge, beliefs and attitudes on for example new instructional methods, their practice will improve and student outcomes will increase. According to Guskey (1986, 2002), however, ‘for the vast majority, becoming a better teacher means enhancing student learning outcomes’ (2002, p. 382) and he therefore argued that significant changes in beliefs and attitudes of teachers are likely to take place only after changes in student learning outcomes have become evident, that is, ‘once the teachers have “field-tested” change proposals in classrooms and experienced first hand change in student learning outcomes’ (Clarke & Hollingsworth, 2002, p. 949). Guskey (1986, 2002) therefore proposed an alternative model of teacher professional development: the ‘Model of Teacher Change’ (see Figure 1). The key element in Guskey’s model is the evidence of improvement in the learning outcomes.

Richardson and Placier (2001), however, present studies that show that in some cases changes in beliefs were preceding changes in practice. In these cases the researchers studied more naturalistic change processes, and concluded that in those processes ‘changes in beliefs appear often to precede changes in practices, or that the process of changing beliefs and practices is at least interactive and synergistic’ (p. 920).

This paper aims to contribute to the discussion about these two positions by studying teacher learning in the context of reciprocal peer coaching. Reciprocal peer coaching can be understood as a professional development trajectory in which pairs of teachers work together to support each others’ professional growth (Ackland, 1991; Engelen, 2002; Joyce & Showers, 2002). Hoyle and John (1995) describe professional development as ‘the process by which individuals acquire the knowledge, skills, attitudes and values which will improve the service they provide to clients’ (p. 17). Since the clients of teachers are first and foremost their students, we could say that reciprocal peer coaching should help teachers to acquire the knowledge, skills, attitudes and values they need to improve their service to the students.

A considerable amount of literature on peer coaching suggests that the professional development of teachers can be improved through experimentation,

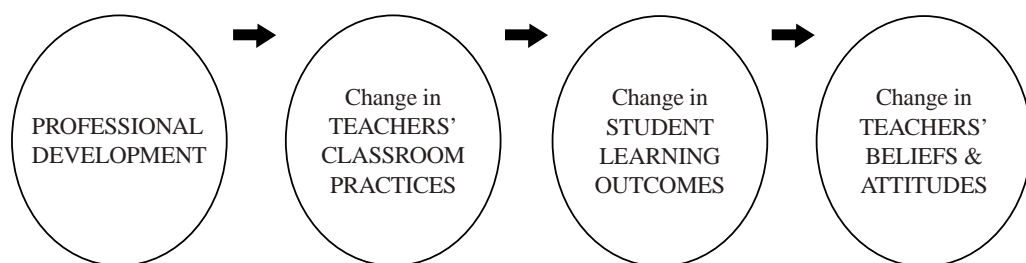


Figure 1. A model of teacher change (Guskey, 2002)

observation, reflection, the exchange of professional ideas, and shared problem-solving (see Robbins, 1991; Joyce & Showers, 2002; Bergen *et al.*, 2006). Reciprocal peer coaching provides teachers with an opportunity to engage in such activities in an integrated form. In the present study we define reciprocal peer coaching therefore as a configuration of activities that a dyad of teachers undertakes in the workplace, with the intention to support each other. This configuration may differ from dyad to dyad and from situation to situation, but there are some basic activities that create the trajectory of reciprocal peer coaching. These activities are:

- two teachers regularly discuss their efforts to support student learning;
- the teachers experiment with instructional methods.

Reciprocal in our trajectory means that the teachers take turns being a teacher coach and a coached teacher. Although observation can be a very important aspect of reciprocal peer coaching, we did not include it in the definition used in our trajectory because teachers are not always able to observe each others' teaching due to the dynamics of the school environment.

Even though empirical evidence shows effects of peer coaching and teacher satisfaction about coaching (Licklider, 1995; Joyce & Showers, 2002), the actual individual professional development processes have not been studied extensively (Desforges, 1995; Wilson & Berne, 1999; Hashweh, 2003). This article tries to bridge this gap by elucidating the learning processes of experienced teachers who took part in a one-year reciprocal peer coaching trajectory. We define learning as a change¹ in teacher cognition and/or behaviour.

When studying the learning processes within the context of reciprocal peer coaching, we must be careful not to overemphasize the intentional, deliberate aspects of learning. Reciprocal peer coaching takes place in the workplace, where teachers learn by all kinds of day-to-day teaching experiences without planning. For example, they spontaneously learn by taking note of remarks made by students or colleagues. They may also learn in non-linear ways by solving problems (Van Eekelen *et al.*, 2005; see also Wubbels, 1992; Kwakman, 2003; Bolhuis, 2006). This is in line with Clarke and Hollingsworth's suggestion that professional growth is a process of the 'construction of cognition by individual teachers in response to their participation in the experiences provided by the professional development trajectory and through their participation in the classroom' (2002, p. 955). Similarly, Johnson (1986a, in Clarke & Hollingsworth, 2002, p. 949) presents a case for reconceptualizing teacher professional development as 'opportunities for learning' to enable it to be 'embedded into the ongoing work of the school'.

For that reason the description of learning processes within the context of reciprocal peer coaching should not be restricted to learning that takes place during the coaching dialogue. Most research into effects of coaching focuses however mainly on the coaching conference (see e.g., Engelen, 2002). Experimentation and the observation of a lesson of a colleague are overlooked as valuable learning opportunities. According to Licklider:

... teachers, observing a colleague in a peer coaching relationship, form conceptions of how new behaviours are implemented. When teachers see colleagues perform a skill that may be difficult or threatening to them, they are more likely to believe they, too, can perform the new behaviour and will, therefore persist in their efforts. (Licklider, 1995, p. 56)

In a similar vein Showers and Joyce assert:

... many believe that the essence of the coaching transaction is to offer advice to teachers following observations. Not so. Rather, teachers learn from one another while planning instruction, developing support materials, watching one another work with students and thinking together about the impact of their behaviour on their students' learning. (Showers & Joyce, 1996, p. 16)

Finally, in our study we want to keep an open mind towards the idiosyncratic and non-linear aspects of the professional development processes that occur when teachers take part in a professional development trajectory like reciprocal peer coaching (Wilson & Berne, 1999; Clarke & Hollingsworth, 2002).

In our study we used the Interconnected Model of Teacher Professional Growth, elaborated by Clarke and Hollingsworth (2002), because this model allows us to recognize the complexity of professional growth by identifying multiple patterns of learning, by assuming a non-linear nature with multiple entry points and by defining professional growth as an ongoing process of learning. After a few adaptations we used this model as an analytical tool to describe the learning process of four teachers who took part in a context of reciprocal peer coaching. Our research question is: what patterns of learning (change in cognition and/or behaviour) of experienced teachers occur when they take part in a reciprocal peer coaching trajectory?

Adaptation of the interconnected model of teacher professional growth

The original model

The Interconnected Model of Teacher Professional Growth provides a framework in which both research positions mentioned in the introduction regarding teacher change can be combined (see Figure 2 for an adjusted version of this model). Clarke and Hollingsworth suggest that change occurs in four distinct domains which according to the authors encompass the teacher's world. The four domains are: the personal domain (PD, teacher knowledge, beliefs and attitudes), the domain of practice (DP, professional experimentation), the domain of consequence (DC, inferred salient student learning outcomes, teacher control, student motivation and student development) and the external domain (ED, sources of information, stimulus or support, such as in-service sessions, professional publications and conversations with colleagues) (2002, p. 950). It is important to note that 'change in the domain of consequence is firmly tied to the teacher's existing value system and to the inferences drawn from the practices of the classroom' (2002, p. 953). For one teacher an increase in student talk may be perceived as a positive outcome of a new teaching strategy while another teacher perceives the same student behaviour as an indication

of chaos and a negative outcome of the strategy. Thus, just like the personal domain, the domain of consequence also pertains to teachers' cognitions (interpretations), while the external domain can be characterized as external stimuli that may influence teachers' cognitions.

The model suggests that a change in one domain is translated into another domain through the mediating processes of enactment and reflection. With the term enactment the translation of a belief or a pedagogical model into action is distinguished from 'acting', 'on the grounds that acting occurs in the domain of practice' (Clarke & Hollingsworth, 2002, p. 951). Acting can be observed by others, whereas the term enactment is used to describe the invisible cognitive processes of translating beliefs into action. Each action represents the enactment of something a teacher knows, believes or has experienced. An example:

Peter believes that the subject matter better sinks in when the students find out what is new and difficult. He translates (enacts) this belief into practice by experimenting with a new way of presenting the subject matter to the students.

The term reflection is considered 'as active, persistent and careful consideration' (2002, p. 953). Enactment leads to change of behaviour whereas reflection leads to change of cognition.

Adaptation of the model

We adjusted the Interconnected Model of Teacher Professional Growth in four ways to satisfy the needs of our study. First, we broadened the concept of reflection since we understand it as: a set of connected mental activities carried out by the teachers in order to structure or restructure an experience, a problem or existing knowledge or insights (Korthagen & Kessels, 1999; Korthagen & Lagerwerf, 2001; Van Woerkom, 2003).

Second, for pragmatic reasons the external domain has been divided into two parts. The first part is specific for the professional development activities the teachers in our study participated in to be able to practice reciprocal peer coaching (a two-day workshop, three follow-up meetings and the coaching activities within the classroom context) and the second part consists of generally available external sources of information, stimulus or support, such as colleagues other than the dyad-partner, study books or newspaper articles. Based on literature on reciprocal peer coaching, we hypothesize that teachers in our study when they report about their learning experiences will mention activities like observing, experimenting and discussing practice (Robbins, 1991; Joyce & Showers, 2002). Since most definitions of peer coaching describe more or less ideal situations, we find it important to test this expectation in the data. Dividing the external domain in the two parts provides us with the opportunity to get insight into the ways in which the teachers use the two external sources in order to learn.

Third, we consider the personal domain to consist of an integrated whole of both theoretical and practical insights, beliefs and orientations such as personal goals,

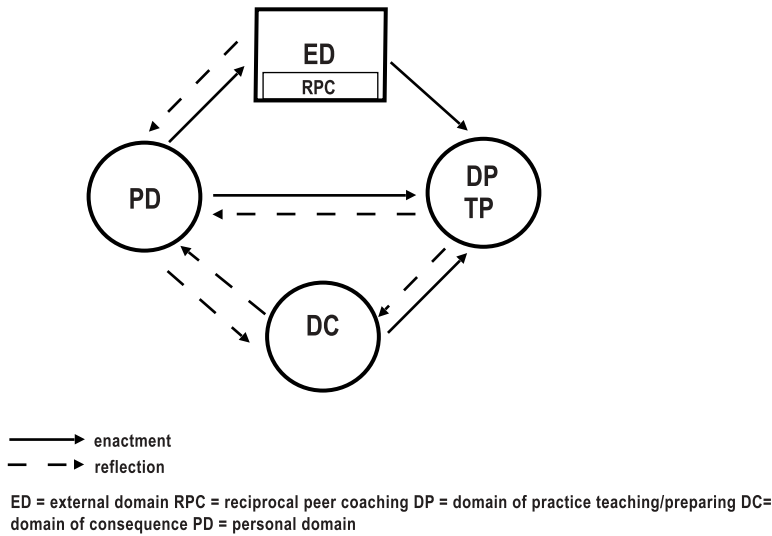


Figure 2. The adapted Interconnected Model of Professional Growth (Clarke & Hollingsworth, 2002)

emotions, expectations and attitudes (Fenstermacher, 1994; Putnam & Borko, 1997; Korthagen & Lagerwerf, 2001).

The last adaptation concerns the domain of practice. Since Showers and Joyce (1996) stated that teachers can also learn while preparing lessons (planning lessons and development of instructional material), we include in the domain of practice preparing as well as teaching the lessons, not only experimenting but also day-to-day routine. In Figure 2, the domain of ‘teaching practice’ is denoted with a capital T, the domain of ‘preparing practice’ is denoted with a capital P.

The interconnected model used as an analytical tool

According to Clarke and Hollingsworth (2002), the interconnected model can serve at least three functions, one of these being a tool for the categorization of teacher change data. The model helps analyse the data specific to each of the four change domains, and supports the empirical identification of patterns in teacher professional growth. Change in one domain does not always lead to change in another, for example when teachers only report a single instance of experimentation. In case changes over domains do occur, we use the term patterns of change. A pattern of change is defined as a constellation of one or more sequences of change. A sequence of change consists of two domains together with the reflective or enactive links connecting these domains, where empirical data support both the occurrence of change in each domain and their causal connection (adjusted from Clarke & Hollingsworth, 2002).

Methods

Context of the study

The present study is situated in the context of a one-year reciprocal peer coaching trajectory that started with a two-day workshop on coaching and being coached. In the trajectory participants worked together in dyads to improve their practice with respect to the support of active and self-regulated student learning. Reciprocal peer coaching as a tool to stimulate professional development was embedded in a larger nation-wide innovation on the support of active and self-regulated student learning. The participants attended three follow-up meetings during the year in which both peer coaching skills and different aspects of how to support active and self-regulated student learning were discussed.

Participants

Data were gathered from four secondary school teachers in two schools in a middle sized urban area in the eastern part of the Netherlands. The project coordinators appointed in each school by the principals asked teachers in their schools to participate on a voluntarily basis in a peer coaching project. The coordinators offered the teachers suggestions for the compositions of the coaching dyads which the teachers accepted.

Data collection

To obtain a rich description of the sequences and patterns of change in cognition and/or behaviour, we employed multiple data collection methods (Merriam, 1998), i.e., repeated measurements with three different instruments over a period of one year. The three data sources were: audiotapes of coaching conferences, audiotapes of semi-structured learning interviews by telephone, and digital diaries with teacher reports of learning experiences.

The teachers audiotaped four of their coaching conferences, spread over the year. Although these conferences were situated in the external reciprocal peer coaching domain, they also gave insight into the other three domains: during the conferences the teachers discussed each others' classroom practice by talking about what they did, why they did it, how they evaluated their performance, what the students did and how the teachers evaluated student outcomes. Semi-structured interviews with each of the

Table 1. Characteristics of the participating teachers

| Name (fictitious) | Gender | Age | Subject taught | Years of experience |
|-------------------|--------|-----|---|---------------------|
| Mary | Female | 57 | Biology | 30 |
| Mark | Male | 49 | Chemistry and general sciences | 20 |
| Jane | Female | 44 | Economics | 15 |
| Peter | Male | 44 | Economics and management & organization | 18 |

teachers directly after the coaching conference added insights about the relationships between the domains as well as the teachers' own perception of the influence of the external domain (more general and for reciprocal peer coaching) on their change processes. The interviews primarily addressed each teacher's perception of the possible cognitive and behavioural changes they gained from the coaching process and how this process developed. Further, the teachers were asked to describe the coaching process. For example, one question was: 'What did you do in your role as coach/coachee?'

In addition, the teachers were asked to send a diary by email every six weeks, with a description of a learning experience in this six-week period. Writing this digital diary provided the teachers with the opportunity to mention learning experiences that were important for their own development. We did ask for any possible learning experience, even if the teachers did not see a relationship between this experience and taking part in the reciprocal peer coaching trajectory. Since we did want teachers to report details of the learning experience, we provided a format for writing their diary (how, when, why and with whom the learning experience occurred and what they thought, felt and did at that moment). If the teachers had not experienced anything that triggered learning, we asked them to report that as well. In Table 2, we present an overview of the data collected.

Data analysis

The coaching conferences and the learning interviews were transcribed verbatim from audiotape. Pseudonyms were assigned to the teachers and the schools to ensure confidentiality. For practical reasons we reorganized the data into four groups defined by the period in which the data were collected. The data from each period were examined and coded for indications of learning (Merriam, 1998). Since we study learning as a shift in teacher cognition and/or behaviour (in our case concerning the support of active and self-regulated student learning), an indication of learning has been interpreted as an indication of change. 'Cognition' was interpreted as an integrated whole of both theoretical and practical insights, beliefs and orientations (personal goals, emotions, expectations and attitudes) with respect to the support of active and self-regulated student learning. 'Behaviour' was described as the reported actions undertaken by a teacher which are in some way related to the support of active and

Table 2. Overview of the data collected

| Name | Coaching conference (CC) | Learning interview (LI) | Digital diary (DD) |
|-------|--------------------------|-------------------------|--------------------|
| Mary | 4 | 4 | 5 |
| Mark | 4 | 4 | 6 |
| Jane | 3* | 4 | 6 |
| Peter | 3* | 4 | 5 |

Note: *The audiotape of the fourth coaching conference got lost in the mail.

Table 3. Indicators of change in teacher reports

| Indicators of change in teacher reports |
|---|
| 1. Statements regarding learning outcomes, made by the teachers themselves An example: <i>I have learned that...</i> |
| 2. Teacher reports of the wish to carry out the behaviour more often An example: <i>I'm sure I'm going to do this the same way next time</i> |
| 3. The use of comparative and superlative degree in teacher reports of events An example: <i>I think about these things now much more than I used to do</i> |
| 4. The use of verbs that incorporate change in teacher reports of events, like: to change, to move, to gain, to go back to, etc An example: <i>I think I gain a lot by using this method</i> |
| 5. The use of change signaling adverbs in teacher reports of events, like: before, different, a different way, suddenly, never before An example: <i>I tend to do things differently now</i> |
| 6. Utterances regarding spontaneous insights made by the teacher An example: <i>Now I see!</i> |
| 7. Utterances indicating surprise or uncertainty made by the teacher An example: <i>I was very surprised that the students liked it</i> |

self-regulated student learning. The identification of the indicators of change was grounded in the reports of the participants (Cohen *et al.*, 2000). Table 3 provides a list of indicators of change.

For each individual teacher we coded the three data sources for indicators of change. For each indicated change, we selected the activities the teachers mentioned in relation to this change.

These activities, combined with the changes in cognition and/or behaviour constitute the change pattern. The time span of these patterns differs from approximately one lesson to a few weeks (see Table 8 and Table 9). The reflective or enactive links between the domains in the various patterns are not always activated immediately. In some cases the teachers later remember something that was said or done in a completely different context than that of the external (more general or reciprocal peer coaching) domain.

An example:

Teacher Peter is preparing his dyad-partner's lesson together with her, and gets a vague idea about the usefulness of the method. He thinks for a moment about using the method himself some time in the future, with a different class and subject matter content. At a later time he suddenly remembers the method and sees ways in which he can use it with the class he has this year. He is now determined to use it in some way.

As a next step for the analysis, the patterns were interpreted in terms of the Interconnected Model of Teacher Professional Growth. In order to do so, we used several criteria slightly adjusted from Justi and Van Driel (2006) to determine the relationships between the four domains (see Appendix). Once we labelled the relationships between the domains, we made a pictorial representation of the patterns of change. An example is given in Table 4.

Table 4. An example of the analysis and pictorial representation of the relations between the four domains

| Teacher Jane | | |
|--|---|---|
| Sequence of activities | Relationships between domains | Criteria |
| When Jane starts working with problem-based education, she uses two assignments developed by colleagues (not the dyad-partner) → this time she wants to use an assignment that she chooses → she decides to adjust her colleague's assignment to fit her own ideas. | From PD to DP _P (1) <i>enactment</i> | A specific aspect of the teacher's cognition influenced the adaptation of the assignment |
| She is insecure about the assignment that she has developed → she asks her colleague to give her feedback on her assignment. | From PD to ED (2) <i>enactment</i> | A specific aspect of the teacher's cognition (insecurity about her own product) influenced what she did in the external domain (seeking feedback) |
| She listens to her colleague's feedback and feels even more insecure → she remembers first version of the assignment (the one that the colleague developed), and then concludes that her colleague's assignment was not much better → she decides to use her own assignment. | From ED to PD (3) <i>reflection</i> | Something that was done or said in the external modified (intensified) the teacher's initial cognitions |
| She hands the assignment out to her students and feels a little insecure about the clarity of it based on the feedback of her colleague → she focuses on the students' response when they start looking at the assignment → she concludes that the students do not respond differently than the previous time. | From DP _T to DC (4) <i>reflection</i> | The teacher notices and reflects on the students' responses |
| She notices that the students start working on the assignment enthusiastically → she feels satisfied about her decision to develop the material herself → she is curious about the upcoming lessons. | From DC to PD (5) <i>reflection</i> | Based on the students' response, she reflects on the quality of her own implementation of the new practice which reinforces her initial ideas |

To strengthen the internal validity of the analysis, the selection and categorization of the patterns of change were conducted independently by two researchers (Cohen *et al.*, 2000). The results obtained by each of them were compared. Only in a few cases was there a difference in the selection and categorization of the activities and the relationship between the domains. In those cases, the difference was discussed until an agreement was reached.

Table 4. (Continued)

| Teacher Jane | | |
|--|--|--|
| Sequence of activities | Relationships between domains | Criteria |
| She discusses her working with this problem-based education assignment with her dyad-partner → she feels stimulated and motivated by her partner but wants more control over the situation and therefore adjusts the time frame of the assignment. | From ED _{RPC} to DP _T (6) <i>enactment</i> | Something that was discussed in the coaching conference influenced something that the teacher did in practice (adjusting the time frame) |

The diagram illustrates relationships between five domains: PD (Problem-based Education), DP PT (Dyad-partner Practice/Teaching), DC (Digital Coaching), ED (Education), and RPC (Reciprocal Peer Coaching). PD is a circle on the left, DP PT is a circle on the right, and DC is a circle at the bottom. ED and RPC are contained within a rectangular box at the top. Arrows indicate the following connections: Arrow 1 points from the box (ED/RPC) to DP PT. Arrow 2 points from PD to the box. Arrow 3 points from the box to PD. Arrow 4 points from PD to DP PT. Arrow 5 points from DC to DP PT. Arrow 6 points from PD to DC.

In Table 4, two arrows (1 and 6) represent enactment and are both drawn towards the domain of practice. Arrow 1 indicates the relationship with the domain of preparing practice (DP_P), whereas Arrow 6 indicates a relationship with the domain of teaching practice (DP_T).

Findings

Analyses of the coaching conferences, learning interviews and digital diaries resulted in a total of 34 pictorial representations of change patterns. In this section we describe the characteristics of these 34 patterns. We try to understand the complex and dynamic process of learning by first describing the various reported entry points of change. Next, we describe the mediating processes and the reported learning outcomes (ending points). Then we discuss various types of patterns.

Entry points

Within the context of reciprocal peer coaching, teachers mentioned several different entry points when they reported learning experiences. Some teachers, for instance, reported that they changed their practice in response to unexpected, undesired student

Table 5. Entry points: frequency and examples

| Entry point | Freq. | Examples of cognition or behaviour |
|--------------------------------|-------|--|
| Personal domain | 9 | When the teacher: <ul style="list-style-type: none"> ● wants or does not want something to happen ● is worried about something |
| External domain (RPC) | 8 | When the teacher: <ul style="list-style-type: none"> ● observes his/her dyad-partner in the classroom and sees him/her do something that he/she thinks is interesting for her/himself as well ● prepares his/her own lessons together with the dyad partner and gets new ideas |
| Domain of practice (teaching) | 6 | When the teacher: <ul style="list-style-type: none"> ● experiments with a new teaching strategy^a ● repeats experimenting with a new teaching strategy |
| Domain of practice (preparing) | 0 | |
| External domain (general) | 5 | When the teacher: <ul style="list-style-type: none"> ● decides to try out new instructional methods together with a colleague (not the dyad-partner) ● hears enthusiastic stories from colleagues about an instructional method and wants to try the method him/herself |
| Domain of consequence | 5 | When the teacher: <ul style="list-style-type: none"> ● responds to mostly unexpected (desired or undesired) student behaviour/learning outcomes by changing his/her cognitions or actions ● responds to feedback from students that s/he him/herself has asked for |
| Other | 1 | When the teacher talks about a combination of both the external (more general) domain and the external (RPC) domain that influenced what she determined to do in her classroom. |

Note: ^a In this situation the teacher does report about performing an experiment (changed practice) but does not say anything about preceding changes in the personal domain.

outcomes (entry point: the domain of consequence), other teachers or teachers at other occasions reported that their idea of how students should learn made them change their practice (entry point: the personal domain). In Table 5, we present the frequencies of the different entry points, and examples of types of cognition or behaviour.

Table 5 shows that in most cases, the pattern of change started within the personal or external domain and that individually preparing a lesson (in the domain of practice) was never in itself mentioned as a starting point for change. When the entry point of a pattern was situated in the domain of consequence, we observed something similar to what Hashweh called anomalies of practice: 'classroom incidents that

contradict teachers' prior expectations' (2003, p. 425). These anomalies can play 'a dual role of refuting prior ideas and instantiating new ones at the same time—in inducing dissatisfaction with prior ideas and making new ones intelligible and plausible' (2003, p. 425).

Mediating processes

The Interconnected Model of Professional Growth does not only provide the possibility of multiple entry points, it also demonstrates that the learning process can start with the mediating process of enactment or with the process of reflection. The thirty-four pictorial representations of the patterns of change showed that reflection occurred more often (21 times) than enactment (13 times) as the first mediating process for change. The teachers varied in the starting processes of their patterns of change. That is, some teachers first reflected, whereas others immediately started acting. The change processes of two teachers (Mark and Jane) most often started with reflection (6 out of 7, and 7 out of 11, respectively), whereas the others (Peter and Mary) started as often with enactment as with reflection (5 to 5, and 3 to 3, respectively). Mark's learning sequences, for example, often started with reflection

Table 6. Ending points: frequency and examples

| Domain | Freq. | Examples of changes in cognition or behaviour |
|--|-------|---|
| Personal domain | 27 | Changed cognition: <ul style="list-style-type: none"> ● The intention to do something in a different way next time ● The re-enforcement of an idea about what works ● Confirmation of ideas/views about the motivation of students ● Awareness of his/her own behaviour ● Being satisfied/proud about his/her own implementation of a new instructional method |
| Domain of practice (teaching) ^a | 4 | Changed behaviour: <ul style="list-style-type: none"> ● The teacher stimulates the students to work together to solve problems ● The teacher does not immediately give the right answer to students |
| Domain of consequence | 2 | Changed cognition: <ul style="list-style-type: none"> ● When the teacher reports a change of practice and says something about the subsequent change in student behaviour but does not say anything about what that means for his/her own ideas, views, perspective, etc |
| External domain (general) | 1 | Changed behaviour: <ul style="list-style-type: none"> ● When the teacher is proud of his own new strategy and tells his colleagues about it |

Note: ^a Because our data consist of teacher reports, most reported learning outcomes have to be interpreted as cognitive, e.g., an idea about changed practice. Even so, sometimes the teachers report about experimenting with a new method with the dyad-partner present in the classroom. They even discuss this new practice in the coaching conference. In those cases it seems unlikely that the teachers did report about something that didn't happen. So, in a sense, the behavioural reports are validated by the dyad-partner and are therefore understood as changes in practice.

Table 7. Types, categories and subcategories of patterns of change in cognition and/or behaviour

| Type | Category | Freq. | Subcategory | Freq. |
|-------------|---|-------|---|-------------|
| Type 1 (23) | 1. Patterns including only the more general external domain | 3 | | |
| | 2. Patterns including both the more general external domain and the external domain specific for reciprocal peer coaching | 8 | | |
| | 3. Patterns including only the external domain specific for reciprocal peer coaching (12) | | 1. Patterns in which the relation with the external _{RPC} domain is established at the beginning of the pattern 2. Patterns in which the relation with the external _{RPC} domain is established at the end of the pattern 3. Patterns in which the relation with the external _{RPC} is the only relationship established | 3 3 6 |
| Type 2 (11) | 1. Patterns not including the external domain with a start in the domain of practice (teaching) | 3 | | |
| | 2. Patterns not including the external domain with a start in the domain of consequence | 4 | | |
| | 3. Patterns not including the external domain with a start in the personal domain | 4 | | |

Table 8. Frequency and examples of patterns not including the external domain

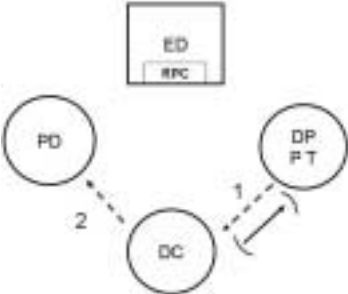
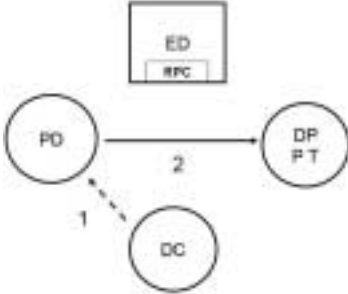
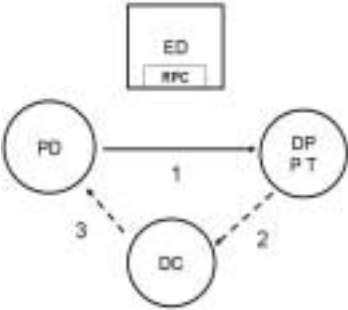
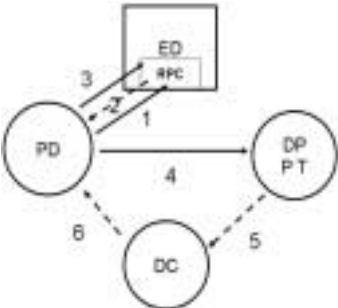
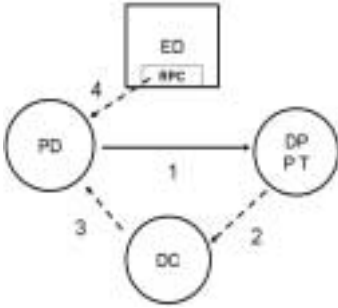
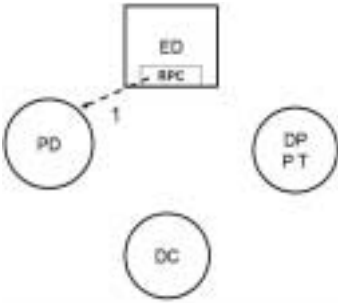
| Example | | | |
|---|-------|--|--|
| Category | Freq. | Description | Pictorial representation |
| Starting in the domain of practice (teaching) | 3 | The teacher experiments with a new instructional method in practice. S/he notices and reflects on student behaviour and modifies his/her cognition and in some cases changes his/her practice at that moment |  |
| Starting in the domain of consequence | 4 | An often unexpected (desired or undesired) student outcome triggered the mediating process of reflection which resulted in a change of cognition. Based on his/her new idea the teacher experiments with another instructional strategy |  |
| Starting in the personal domain | 4 | The teacher has a specific educational view (for example: students learn more when they find out what is difficult for themselves) and changes his/her teaching practice accordingly. S/he notices and reflects on the student outcomes and based on the evaluative reflection on these outcomes, modifies his/her cognition |  |

Table 9. Frequency and examples of patterns including only the external domain specific for reciprocal peer coaching

| Example | | | |
|---|-------|--|--|
| Category | Freq. | Description | Pictorial representation |
| Patterns in which the relation with the external _{RPC} domain is established at the beginning of the pattern | 3 | The teacher asks his/her dyad partner for help before experimenting in practice, the teacher gets ideas in the two-day workshop or the teacher changes his/her practice immediately when the dyad-partner enters the classroom for observation |  |
| Patterns in which the relation with the external _{RPC} domain is established at the end of the pattern | 3 | The teacher discusses his/her own experiences in a post-conference based on, among other things, classroom observations by the dyad-partner and gets new ideas, insights, or makes plans to change practice in the future |  |
| Patterns in which the relation with the external _{RPC} domain is the only relationship established | 6 | The teacher observes his/her dyad-partner, the teacher prepares his/her lesson together with the dyad partner or is in the role of coach listening to the dyad-partner in the post-conference and gains ideas, insights, etc |  |

as a result of a change in the domain of consequence or the external reciprocal peer coaching domain.

Mark is sitting in the back of the classroom observing a lesson of his dyad-partner. He sees that his partner has another style of teaching than he has himself. He interprets this style to be more ‘loosely’ than his own. He notices that the students take actively part in the lesson anyway. He thinks that he might try teaching a little bit more loosely himself.

The sequences of Peter, however, usually started with enactment of an idea into practice: with experimenting.

Peter thinks that the subject matter better sinks in when the students find out what is new and difficult. He develops a new way of presenting the subject matter: he integrates the new subject matter in the exercises which the students have to start making without preceding instructions or theory presented by the teacher.

Ending points

The patterns of change not only had various entry points, but also different ending points. Table 6 shows what kind of ending points the teachers reported and subsequently what kind of changes in cognition and/or behaviour could be distinguished.

The overwhelming majority of the ending points were in the personal domain. Content wise, many more ending points demonstrated that teachers reported changes in cognition than changes in behaviour. Further, we observe that ending points in the personal domain represented relatively small changes such as the reinforcement of ideas already in the teacher's mind, the behavioural intention to change practice without actually changing that practice yet, and awareness of own behaviour. In addition, changes in emotion were mentioned as ending points, for example, being satisfied or proud. It is interesting to see that emotions seemed to play an important role in the teachers' perception of their professional development when taking part in reciprocal peer coaching (see also Hargreaves, 1998; Day & Leitch, 2001).

Types of sequences

Some patterns of change presented in the pictorial representations did and others did not include the external domain. These two groups of patterns could be divided into six categories and three subcategories to be described in the next sections. Table 7 presents the categories and subcategories of these patterns.

Patterns not including the external domain. Although the teachers took part in reciprocal peer coaching, 11 out of 34 pictorial representations did not show a relationship with the more general external domain or the external reciprocal peer coaching domain. The 11 patterns emerged from all four teachers. The patterns could be grouped into three categories. Patterns which started in the domain of practice (teaching), the domain of consequence, and the personal domain. The categories and examples of the patterns are presented in Table 8.

Patterns including the external domain. Earlier we discussed the adaptation of the Interconnected Model of Teacher Professional Growth. We divided the external domain into two parts (the general external domain and the external reciprocal peer coaching domain) to have the opportunity to get insight into the ways in which the teachers use two different external sources in order to learn. We now discuss the

characteristics of the patterns related to this division. The patterns that included the external domain could be grouped into three subcategories, namely, patterns including only the general external domain, patterns including both the general and the reciprocal peer coaching domain, and patterns including only the external reciprocal peer coaching domain. We describe examples of the three types of patterns in the next sections.

The general external domain. Three patterns included only the general external domain. In two of these an educational course parallel to the reciprocal peer coaching trajectory influenced the teacher. In the third situation the teacher was observing a lesson that was given by a student teacher.

Combination of the general external domain and the reciprocal peer coaching domain. In eight out of 34 pictorial representations a relationship was found between both the general external domain and the external reciprocal peer coaching domain on the one hand and one or more of the other three domains on the other. In most patterns we saw at the entry point the enactment of something that happened in the more general external domain, for example: deciding to experiment with a specific instructional strategy together with a colleague (not the dyad-partner) or seeking and receiving feedback from a colleague (not the dyad-partner). At the end of the pattern we usually found reflection on something that happened in the reciprocal peer coaching domain. The latter included for example preparing lessons and having a post-conference together with the dyad-partner. It is interesting to note that we found that teachers also changed their practice in response to something that was about to happen in the external (more general or reciprocal peer coaching) domain, but had not yet occurred. An example:

Teacher Jane is aware of the fact that her dyad-partner is observing her in the classroom. She imagines what he might be asking her later on in a post-conference and already changes her practice in the direction she thinks her dyad-partner would want her to change.

Patterns including the more general external domain can refer to other colleagues, but also to the organizational level of the school (e.g., a change in the school timetable).

The external reciprocal peer coaching domain. In 12 out of the 34 pictorial representations a relationship was found between the external reciprocal peer coaching domain, and one or more of the other three domains. These patterns could be divided into three subcategories:

1. Patterns in which teachers changed based on something that happened during a reciprocal peer coaching activity at the beginning of the pattern (three).
2. Patterns in which teachers changed based on something that happened during a reciprocal peer coaching activity at the end of the pattern (three).
3. Patterns in which the relationship with the external reciprocal peer coaching domain was the only relationship established (six).

Examples of the categories are presented in Table 9.

The patterns in which the relation with the external reciprocal peer coaching domain is the only relationship established, were the only patterns not including the domain of consequence. All other 28 patterns included this domain. An explanation for this might be that the main activity undertaken by the teachers in this type of pattern was observing the dyad-partner teach in his/her classroom. When observing, the teachers never formulated a learning goal for themselves but always focused on the learning process of the dyad-partner. As a consequence, they did notice student behaviour but this seemed to have a different impact on their learning processes than when they themselves were teaching their own students.

In view of our decision to divide the external domain into two parts we conclude that this division made it possible to show that patterns of change within a context of reciprocal peer coaching do not necessarily include reciprocal peer coaching activities.

Conclusion and discussion

The research question posed in this article was: what patterns of change in cognition and/or behaviour of experienced teachers occur when they take part in a reciprocal peer coaching trajectory? By answering this question we wanted to contribute to the discussion revolving around the issue on changes in knowledge, beliefs and attitudes preceding or following changes in teacher practice (Wubbels, 1992; Richardson & Placier, 2001; Bolhuis, 2006). We analysed and categorized types of patterns of change in behaviour and/or cognition, by using an adaptation of the Interconnected Model of Teacher Professional Growth (Clarke & Hollingsworth, 2002) as an analytical tool. Based on the slightly adjusted criteria for the establishment of relationships between different change domains, developed by Justi and Van Driel (2006), we were able to represent pictorially the various patterns of change reported by the teachers.

From our study we conclude that there is not one answer to the question whether change in teacher cognition is preceding or following change in teacher practice. We found a variety of entry points, suggesting that the start of teacher learning is not a monopoly of the external domain (of, e.g., professional development programs), the domain of consequence (as Guskey suggested) or any other. Teacher learning seems to start anywhere, although remarkably we did not find an entry point in individually preparing for teaching. Ending points are very often in the personal domain: teachers reported changes in cognition more often than changes in behaviour. This may be partly due to the fact that the data provide insight of teacher change at given moments in time, and partly due to a tendency in teachers' reporting: it may seem more sophisticated to report on cognition than to be explicit about changes in practice. Teachers might associate learning with knowledge and thinking rather than behaviour. Also, some cognitions refer to behaviour. An example: being proud of implementing a new instructional method. Teachers varied in the mediating processes they reported: reflection occurred more often, but enactment was also reported and seemed

favourite in other teachers. Concerning ending points, we need to realize that these are always preliminary: ending points indicate learning results at a certain point in time. In a following time period teachers may continue their professional development, at the same or another point. Especially for the emotional ending points it seems likely that these emotions will trigger new reflection processes. In short, we found a variety of learning patterns indicating that change may start, proceed and (temporarily) stop in many different ways.

By adjusting the model to include the distinction between the more general external domain and the external reciprocal peer coaching domain we were able to get insight into the ways in which the teachers use the different external sources. Patterns of change within a context of reciprocal peer coaching did not necessarily have to include reciprocal peer coaching activities. The teachers changed in response to student outcomes not including the external domain in situations in which the teacher reacts to unexpected and undesired student behaviour. This is in line with Guskey's view that 'teachers feel rewarded when students' behaviour and results seem satisfactory, if not, an explanation is needed' and something needs to be done (2002). In the latter case, a process of reflection resulted either in an evaluative analysis of the student outcomes and a subsequent insight into the learning processes of students, or it resulted in enactment by which the classroom practice changed in action (Schön, 1983). If, however the patterns did include the external reciprocal peer coaching domain, this was often part of a change process in which reactive activities in the domains of practice and consequence were involved as well. These patterns often demonstrated complex change processes.

Limitations of our study

Although the Interconnected Model of Teacher Professional Growth served as a useful tool for the analysis of change patterns, focusing on the mediating processes of reflection and enactment in the model fails to take notice of learning within a domain. Thus, when a teacher, e.g., develops a certain practice without much conscious thought and keeps up with this practice, this learning process is not noticed. To study this more deeply by analysing what exactly the teachers think, do or feel when they consciously or unconsciously change within one domain, seems an interesting perspective for further research.

Further, we collected data of three sources and from repeated measures, but only analysed data of four teachers. In following studies it would be interesting to look for the patterns of change on a larger scale, so that we may gain a more general insight in the various ways teachers learn. Although our data were based on self-report, we do think reports were fair in the sense that when teachers reported about a change in their practice there was indeed a change. We think so because of the context of reciprocal peer coaching in which they discussed changes with their dyad-partner, who also observed in the classroom. However, it may be wise to include other methods to measure changes in practice, independent of teacher reports in next studies, because of the possible tendency to report on cognition.

In conclusion, despite the above mentioned limitations, the exploration of teacher change within the context of reciprocal peer coaching proved to be a fruitful endeavour. Our study indicated the usefulness of the adapted Integrated Model of Teacher Professional Growth for analysing the processes of teacher learning within the context of reciprocal peer coaching.

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Note

1. Although in much literature teacher change is only regarded as learning when the teachers reach a learning goal set by them or by the professional development trajectory, we do not evaluate the direction of the change in that way. Every change, even undesired change, is regarded to be learning.

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Appendix. Criteria for the establishment of the relationships in the IMTPG

| Relationships | Mediating processes | Criteria |
|------------------------------|---------------------|--|
| From PD to ED | Enactment | When a specific aspect of teacher's initial cognition influenced what s/he did or said in the external domain |
| From PD to ED _{RPC} | Enactment | When a specific aspect of teacher's initial cognition influenced what s/he did or said during the coaching activities (preparing lessons together, observing each other or having a coaching conference) |
| From ED to PD | Reflection | When something that happened in the external domain modified the teacher's initial cognitions |
| From ED _{RPC} to PD | Reflection | When something that happened during the coaching activities modified the teacher's initial cognitions |
| From ED to DP | Enactment | When something that happened in the external domain influenced something that occurred in the teacher's practice |
| From ED _{RPC} to DP | Enactment | When something that happened during the coaching activities directly influenced something that occurred in the teacher's practice When the existence of someone from the external _{RPC} domain in practice directly influenced something that occurred in the teacher's practice |
| From PD to DP | Enactment | When a specific aspect of the teacher's cognitions influenced something that occurred in the teaching practice |
| From DP to PD | Reflection | When something that the teacher did in his/her teaching practice modified his/her cognitions (without reflecting on student outcomes first) |
| From DP to DC | Reflection | When the teacher noticed and reflected upon something that s/he or her/his students did in the teaching practice that caused specific outcomes (like student learning, teacher control, student motivation and student development) |
| From DC to DP | Enactment | When a specific outcome made the teacher state how they would modify the associated teaching practice in the future When a specific outcome made the teacher change his/her practice at that moment (reflection-in-action) |
| From DC to PD | Reflection | When teachers reflected on a specific outcome, thus changing a specific aspect of their previous cognitions Represents the teacher's evaluative reflection on the salient outcomes, which led to a change in cognition |
| From PD to DC | Reflection | When a specific aspect of the teacher's cognition helped him/her in reflecting/analysing a specific outcome of his/her teaching practice |